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<p>(21) International Application Number: PCT/AU89/00271</p> <p>(22) International Filing Date: 22 June 1989 (22.06.89)</p> <p>(30) Priority data: PI 8915                  22 June 1988 (22.06.88)                  AU</p> <p>(71)(72) Applicant and Inventor: WILLIAMS, Edward, Albert [AU/AU]; 26-28 Fitzroy Avenue, Camden Park, S.A. 5038 (AU).</p> <p>(74) Agent: COLLISON &amp; CO.; 117 King William Street, Ade- laide, S.A. 5000 (AU).</p> <p>(81) Designated States: AT (European patent), AU, BB, BE (Eu- ropean patent), BF (OAPI patent), BG, BJ (OAPI pa- tent), BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE (Euro- pean patent), DK, FI, FR (European patent), GA (OAPI patent), GB (European patent),</p>		<p>HU, IT (European patent), JP, KP, KR, LK, LU (European pa- tent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL (European patent), NO, RO, SD, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US.</p> <p>Published <i>With international search report.</i></p>
(54) Title: INSECT EXTERMINATOR		
(57) Abstract		
<p>A method or arrangement for eradicating insects including the release of an attractant stored in a container (4) from within a housing (3) so as to attract insects into the housing (3). A neutralizing means (10) is positioned at apertures (5) leading into the housing (3) and insects are neutralized as they attempt to enter the housing. A grill (9) may be provided to protect others from contacting the neutralizing means (10). Dispersal of the attractant may be accelerated by a dispersal means (15) such as a fan.</p>		

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## INSECT EXERMINATOR

This invention relates to insect eradication and in particular to means for attracting and neutralizing insects.

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Insects such as mosquitoes and flies, create problems of world-wide significance, both at an economic level and at a medical or veterinary level, with mosquitoes, for example, accounting for considerable loss of blood from stock and the spread of disease among animals and man, and flies accounting for stock diseases such a fly-strike. On a medical level mosquitoes provide the only vector for the transmission of many infectious agents such as malaria and the Tse-Tse fly providing a vector for sleeping sickness. Moths such as the Codling moth can also cause a significant economic loss.

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The isolation of stock or man from these insects is possible only to a very limited extent. The provision of netting or the like as a barrier can isolate humans and stock from these insects, however, this isolation is certainly not practical over extended periods of time.

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The eradication of flying insects such as mosquitoes and flies, or at least the means for significantly reducing the numbers of these insects is thus of great importance rather than merely isolating stock.

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Producing aerosols containing doses of insecticides can be used to kill insects in localized areas such as inside houses or shed for a limited period of time, however, this does not provide a long term effect. Furthermore in open environments such as stock sheds and open houses insects such as mosquitoes frequently blood feed and leave without contacting pesticide treated walls and ceilings, and thus in these cases passive defence is ineffective.

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Eradication programs have been mounted on a larger scale with the spraying of insecticides in areas such as the breeding grounds of these insects. These eradication programs have proved to be quite effective.

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Insecticides, however, are not entirely selective and these toxins can affect populations other than the target populations, thereby upsetting the usually delicate ecological balance of the target area. This upset can often also be caused by a gradual  
10 accumulation of pesticides in the area after an extended period of use. Thus it is an object of this invention to provide for a means of positively neutralizing flying insects without resort to toxic agents detrimental to the environment. An object of a preferable form of this invention is to provide a means for  
15 selectively eradicating those insects that have adverse economic, medical or veterinary effects in selected areas.

It has been discovered that neutralization of insects can be effectively achieved by the release of a non toxic attractant  
20 from a central location so as to attract insects to the central location and there further being provided a neutralizing means at the central location for neutralizing insects so attracted.

The neutralizing means can take many forms and may even  
25 involve the use of an insecticide. If the insecticide is kept at a central depot, and not sprayed into the environment, the impact of such toxins on the environment can be considerably diminished. Neutralization means other than the use of insecticides are preferably employed, however, so that no toxic  
30 material is dissipated into the environment.

The use of an attractant to bring the insects to a centrally located neutralizing means has several advantages. The attractant can be selected to be relatively specific and thus  
35 specific insects may be attracted to the central depot. The neutralizing means can also be constructed to be specific for the

- pest of interest, so that for example specifically sized apertures may be provided to allow access only to one of a group of insects attracted by a given attractant. Further the neutralizing means can also safely include the use of non-specific insecticides because insects disposed of by the invention are all centrally collected, and thus can easily be made unavailable for consumption by other forms of life that may be adversely affected by the consumption of these insecticides.
- 5
- 10 A variety of attractants can be employed and a requirement for these is that they must be transmissible and that can include dispersion in the form of a vapour or in gaseous form so that they can be dispersed or transmitted in air. A further, more important, requirement is of course that they do attract the
- 15 insects of concern.

- Attractants of female mosquitoes can include traces of volatile chemicals similar to those emitted from citrated blood. Attractants for various species of fly include traces of substances chemically similar to those emitted by putrefying substances and not limited to, but including aliphatic diamines, amino aliphatic esters; butyric acid and its esters and certain alkenes and dienes. Further attractants of various species of fly include volatile substances chemically similar to those emitted
- 20
- 25 by food products.

- Other attractants that could be useful are ones that have been found to be effective with some insects such as the emittance of a sound of the frequency provided by the opposite gender of a member of a given species. This is particularly effect for attracting male mosquitoes.
- 30

- A most effective agent for attracting mosquitoes over a relatively long distance has been found to be carbon dioxide so that the attractant according to the invention preferably includes carbon dioxide.
- 35

Carbon dioxide is dispersed quite well into the area surrounding the central location without the mechanical distribution. If sufficient carbon dioxide is released from the central location insects such as mosquitoes can be attracted from as far as a few hundred meters to the central location. However some forms of attractant require the use of a mechanical dispersant. Thus in an embodiment of the invention there is provided at the source of the attractant a dispersing means adapted to disperse the attractant and distribute it either in a selected direction or uniformly radially from the central location into an area surrounding the central location.

The dispersant means can take the form of a fan or can be provided by an adaptor harnessing the flow of attractant released from a pressurized bottle or cylinder to disperse the attractant.

In order to attract insects from as large an area as possible it is necessary that a relatively substantial quantity of attractant be released. Thus in the case of carbon dioxide a means for effecting extended release of relatively substantial amounts of carbon dioxide must be provided if it is desired to attract insects from a large area.

The means for effecting an extended release of carbon dioxide can be variously achieved but in one embodiment comprises an insulated container appropriate to hold frozen carbon dioxide as a dry ice and an outlet from such an insulated container to allow for the gradual release of such carbon dioxide as it sublimates from the dry ice within the container.

As an alternative there is provided a container in which a susceptible chemical is placed and there are provided heating means that over an extended period, under such heating, the heating will emit carbon dioxide.

In preference, such a chemical can comprise a carbonate or a bicarbonate.

5 Alternatively there can be provided a burner to effect a slow combustion of a carboniferous fuel such a wood to effect the release of carbon dioxide upon the oxidation of the carbon within the fuel. With such a supply, however, in order that repellents of insects are not released, there is provided a filter,  
10 with an absorptive agent such as activated charcoal, to absorb volatile repellents released upon combustion of the carbon containing fuel, and the repellents are thus not released together with the carbon dioxide.

15 On a larger scale, the combustion of carbon itself can be achieved, to effect the release of carbon dioxide. The combustion of carbon will not require the use of a filtering or absorptive device.

20 Another form of source of carbon dioxide is a bottle or cylinder of pressurized carbon dioxide, this form has the advantage of control; a given level of carbon dioxide can be continually supplied over a time period to the area very effectively. It may also be desirable only to attract insects at particular times of the  
25 day, and release in this embodiment, and others, is possible at set times over any cycle.

It has been discovered that carbon dioxide can very effectively be provided as an attractant over a large distance such as a  
30 hundred meters, however, once insects have approached the central location it is found preferable to further attract the insects so that they specifically contact the neutralization means.

35 Thus in a preferable form of the invention there is provided a means for eradicating insects by the release of an attractant,

preferably carbon dioxide, so to attract insects over a longer range, and the release of a second attractant to attract insects over a shorter range, and the provision of a neutralization means at a central location.

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Any one of the attractants mentioned above, apart from carbon dioxide, can be used as the second attractant.

10 Chemical attractants such as sugars have also been found to be particularly effective in attracting male mosquitoes over short distances.

15 In another form the attractant over the smaller area can be provided by warmth and moisture, thus the provision of warm or vaporized water, can act as an attractant sufficient to keep insects such as mosquitoes attracted to the central location where the neutralizing means is located.

20 In another form there can be provided an item such as a particle of food. As the particle of food decomposes due to the action of degrading enzymes and organisms, volatile factors attractive to a range of insects are released, and these can act as attractants over a short distance. These can also be used as attractants over a longer range in the place of carbon dioxide, however, this  
25 is not as desirable because of the unpleasantness of the odours. Thus it is more desirable to provide these as small samples.

In another form the short range or long range attractants can be provided by a pheromone such as is known to attract the insect  
30 of interest. Extracts from the body odours of target animals also often provide an attractant to insects.

A further short range attractant can be the level of light. It has been discovered that selected insects are attracted to low levels  
35 of light. Thus the provision of an area with a low level of light can act as an attractant. Thus in one embodiment the source of



attractant and the neutralization means are housed in a darkened container with an entrance to provide for access by the insect. The entrance being such that only a very limited amount of light illuminates the inside of the container.

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Further an attractant such as a natural attractant can be provided, by allowing for a group of animal to be enclosed in enclosure such as a sealed shed, with an aperture, and within that aperture a neutralization device, whereby a long range  
10 attractant is released through the opening, and the odours of the animals also wafts through the opening to act as attractants over the short range.

Thus an opposite strategy to what is normally employed in  
15 relation to insects can provide an effective active neutralization of insects. Instead of attempting to repel insects from the housing of animals or humans, the insects are actively attracted to the housing of animals or humans, and access by insects can only achieved by exposure to the neutralizing means.

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The attractant can thus be provided by humans in a house whereby the neutralizing means is situated in an aperture such that access to the house, or more particularly to the humans can only be achieved by exposure to the neutralizing means. Thus  
25 the attraction to humans is fatal.

The neutralizing means can be of many sorts, however, the preferred embodiment is an electrocution device including a plurality of spaced apart wires such that each of the plurality of  
30 wires is of one polarity or the other and each successive wire is of opposite polarity, the voltage between each of the adjacent wire being sufficiently high to cause electrocution of insects passing therebetween. The spacing of the wire is preferably to suit the size of the insect, thus for smaller insects smaller  
35 spacings are required. Further the spacing of the wire in one embodiment of the invention is adjustable. In preference such

an electrocution device would be placed between the area where the insects are being attracted from and the source of the attractant, such that to get to the attractant, the insects have fly through the electrified grid.

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Alternatively there can be provided a dish having therein water and a surfactant such that insects expecting to use surface tension of the water will in fact be deceived and accordingly will be drowned.

10

Neutralization can be achieved by the provision of a strong fan or other air pumping device that is positioned so as to suck the insects or the like into an air but not insect permeable bag.

15 For a better understanding of the invention reference is now made to the drawings in which

FIG. 1 is a plan view of a central location within an area for attraction of insects to said central location,

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FIG. 2 is a part cross-sectional view of a first embodiment of a means for neutralizing insects according to the invention,

25 FIG. 3 is a part cross-sectional view of the layout of a neutralizing means according to a second embodiment of the invention,

FIG. 4 is a part cross-sectional view of a third embodiment of a means for neutralizing insects according to the invention,

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FIG. 5 is a part cross-sectional view of a second embodiment of a dispersal means for attractant, according to this invention, and

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FIG. 6 is a part cross-sectional view of a fourth embodiment of a means for neutralizing insects according to the invention.

- 5 Referring to FIG. 1 there is provided at a central location (1) an attractant releasing means and an insect neutralizing means. The attractant releasing means is adapted to release attractant over an area (2).
- 10 Referring to FIG. 2 there is provided at a central location (1) an insect neutralizing arrangement (3) comprising a carbon dioxide source (4) which is preferably a cylinder of pressurized carbon dioxide. A housing (5) with a circular base (6) and a circular roof (7). No walls are provided and there is thus provided an
- 15 aperture (8) all the way around the side of the housing (5). A protective grill (9) is provided to prevent animal or man contacting the neutralizing means (10) through the aperture (8) at a side periphery of the housing (5). A bath (11) is provided and is adapted to be filled with water (12) and includes heating
- 20 elements (13) therein for providing a secondary attractant of warmth and moisture. The carbon dioxide is passed from the source (4) through a regulator (14) and a non return valve, and is bubbled through the water (12), thereby inducing the production of an aerosol of warm water vapour, as a second
- 25 attractant. There is provided a fan (15) acting as a dispersal means for dispersing the attractant. Neutralizing means (10) are provided inside the housing (3). The neutralizing means is in the form of a grid of spaced apart electrodes (16) with adjacent electrode of opposite polarity to effect an electrocution
- 30 of insects that pass between adjacent electrodes.

FIG. 3 illustrates an embodiment of a neutralizing means adapted for use in housing for humans or animal. The neutralizing means (10) is in the form of a grid of spaced apart

35 electrodes (16) with adjacent electrode of opposite polarity to effect an electrocution of insects that pass between adjacent

electrodes. Although other forms of neutralizing means can be used in this circumstance. The strategy used in this embodiment of the invention is to allow the attractants produced by humans or animal to work but allow access for insects to the attractants only through contact with a neutralizing means (10). Thus in a particular form of this embodiment, a house is provided with suitable insect proofing, in the form of screens for doors and windows, with the closure of gaps that often occur between door or windows and their frames. The house is provided with one (or more) apertures (17) through a wall (18) so that attractants emanating from humans living within can waft into the surrounding area. Insects are attracted to such an aperture (s) (17) however on attempting to gain access they make contact with the neutralizing means housed within the aperture (17) and are neutralized.

Referring to FIG. 4 there is provided a housing similar to the embodiment shown in FIG. 2 using as attractant carbon dioxide, produced by combustion of carboniferous matter in a combustion chamber (19). The combustion chamber has an outlet (20) communicating with a filter (21). The filter can include an absorptive agent such as activated charcoal and is designed to absorb any repellent that are volatilized by the combustion of the carboniferous material. A controlling damper (22) can be provided within that outlet (20) to regulate the extent of combustion of the carboniferous material.

Referring to FIG. 5 there is provided a dispersal means for dispersal of an attractant, and includes a container (23) for storage of the attractant, a valve (24) to regulate the release of attractant from the container (23). An air pump (245) operates to suck out attractant from the container (23) and impel the attractant against an adaptor (26) which acts to use the pressure of attractant to disperse it from the central location and into the area from which insects are to be attracted.

Naturally, additional ports are provided to allow for a mixing of attractant with air.

Referring to FIG. 6 there is provided a darkened housing (28) wherein a very limited amount of light illuminates the interior. Inside the darkened housing is a source of attractant, in this instance carbon dioxide is released passively from a carbon dioxide source. Walls (29) are provided to prevent light from entering the darkened housing (28), at least one aperture (30) is provided to allow access by insects to the interior of the box (31). Adjacent the aperture(s) are neutralizing means (10) to effect a neutralizing of the insects.

**THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-**

- 5 1. A method of neutralizing insects including the steps of releasing an attractant from a central location (1) in an area (2), and the neutralization of insects so attracted by neutralizing means (10), said attractant being transmissible through air, and adapted to act as an attractant to at least one species of insect.
- 10 2. A method of neutralizing insects as in claim 1 wherein the attractant is chosen from any one or combination of the following:
- 15 volatile trace chemicals similar to those emitted from citrated blood;
  - substances chemically similar to those emitted by putrefying substances including aliphatic diamines, amino aliphatic esters, butyric acid and its esters and certain alkenes and dienes;
  - 20 volatile substances chemically similar to those emitted by food products;
  - emittance of a sound of a frequency emitted by the opposite gender of a member of a species;
  - carbon dioxide;
  - 25 sugars;
  - pheromones;
  - trace chemicals similar to those emanating from the bodies of humans or animals.
- 30 3. A method of neutralizing insects in any one of claims 1, 2 or 3 wherein there is provided a first attractant and a second attractant said first attractant adapted for attraction of members of at least one insect species over a long distance and said second attractant adapted for attraction of said at least one
- 35 insect species over a short distance.

4. A method of neutralizing insects as in claim 3 wherein the first attractant includes carbon dioxide.

5. A method of neutralizing insects as in either of claims 3 or 4 wherein the second attractant is provided by the release of water vapour and warmth.

6. A method of neutralizing insects as in anyone of the preceding claims wherein the attractant (or attractants) is (are) actively dispersed from the central location(1) by a dispersing means (15).

7. A method of neutralizing insects as in either of claims 1 or 6, wherein said attractant emanates from humans or animals enclosed within a housing said humans or animals isolated from said at least one species of insects present in the area, apart from an aperture (17) in said housing and said neutralizing means (10) being located within said aperture (17), so that insects are neutralized within said aperture (17).

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8. A method of neutralizing insects as in any one of claims 3, 4, 5, or 6, wherein said second attractant emanates from humans or animals enclosed within a housing said humans or animals isolated from said at least one species of insects present in the area, apart from an aperture (17) in said housing and said first attractant being released through said aperture (17), and said neutralizing means (10) being located within said aperture (17), so that insects are neutralized within said aperture (17).

9. A method of neutralizing insects as in any one of claims 3, 4, 5, or 6 wherein said second attractant is the provision of a darkened housing (28) allowing entry of only a low level of light, the neutralizing means (10) being enclosed within said darkened housing.

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10. A method of neutralizing insects as in any one of the preceding claims wherein the neutralization means includes an electrocution device, including a grid of spaced apart electrodes (16) to effect an electrocution of insects passing therethrough.
- 5 11. A method of neutralizing insects as in any one of the preceding claims wherein the insect is a mosquito.
12. A method of neutralizing insects as in any one of the preceding claims where the first attractant includes carbon dioxide, said carbon dioxide being provided by the combustion of a carboniferous fuel within a combustion chamber (19).
- 10 13. A method of neutralizing insects as in the immediately preceding claim wherein there is provided a filter (21) for absorption of otherwise removing of repellents volatilised from said carboniferous fuel together with carbon dioxide upon combustion.
- 15 14. An arrangement for neutralizing insects including means for releasing attractant from an attractant source (4) at a central location (1) into said area (2), and a neutralization means (10) adapted for neutralization of insects so attracted to said central location (1), said attractant being transmissible through air, and
- 20 25 adapted to act as an attractant to at least one species of insect.
15. An apparatus for neutralizing insects as in the previous claim wherein there is provided a darkened housing (28) enclosing a neutralizing means (10), said dark housing (28)
- 30 allowing entry of only a low level of light, and including at least one aperture (30) for the entry of insects.
16. An arrangement for neutralizing insects as in any one of the preceding claims wherein the neutralization means (10)
- 35 includes an electrocution device, including a grid of spaced apart



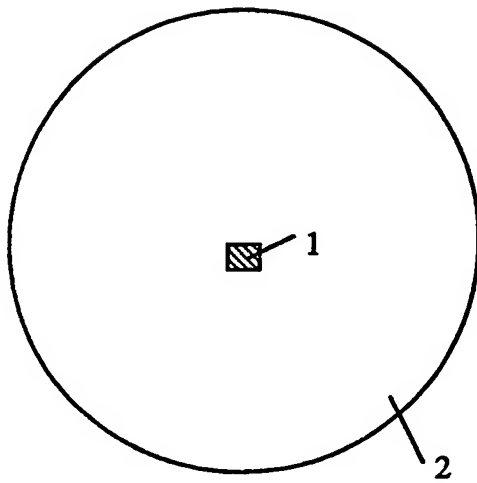
electrodes (16) to effect an electrocution of insects passing therethrough.

17. An arrangement for neutralizing insects as in any one of  
5 the preceding claims wherein said means for releasing  
attractant includes a combustion chamber (19) adapted for slow  
combustion of a carboniferous fuel including a combustion  
chamber outlet communicating with a filter (21) for absorption  
or otherwise removing of repellents volatilised from said  
10 carboniferous fuel together with carbon dioxide upon  
combustion, and a filter outlet (27) for releasing said carbon  
dioxide.

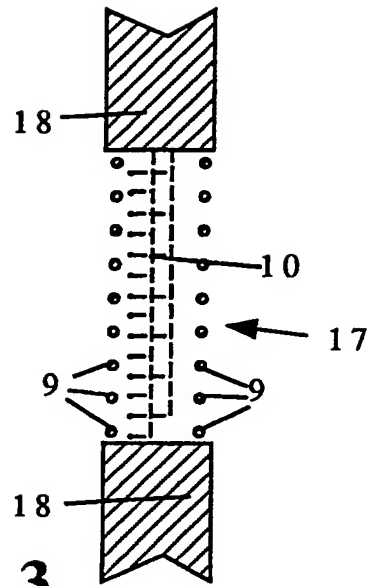
15 18. A method of neutralizing insects substantially as  
hereinbefore described.

19. An arrangement of neutralizing insects substantially as  
hereinbefore described.  
20

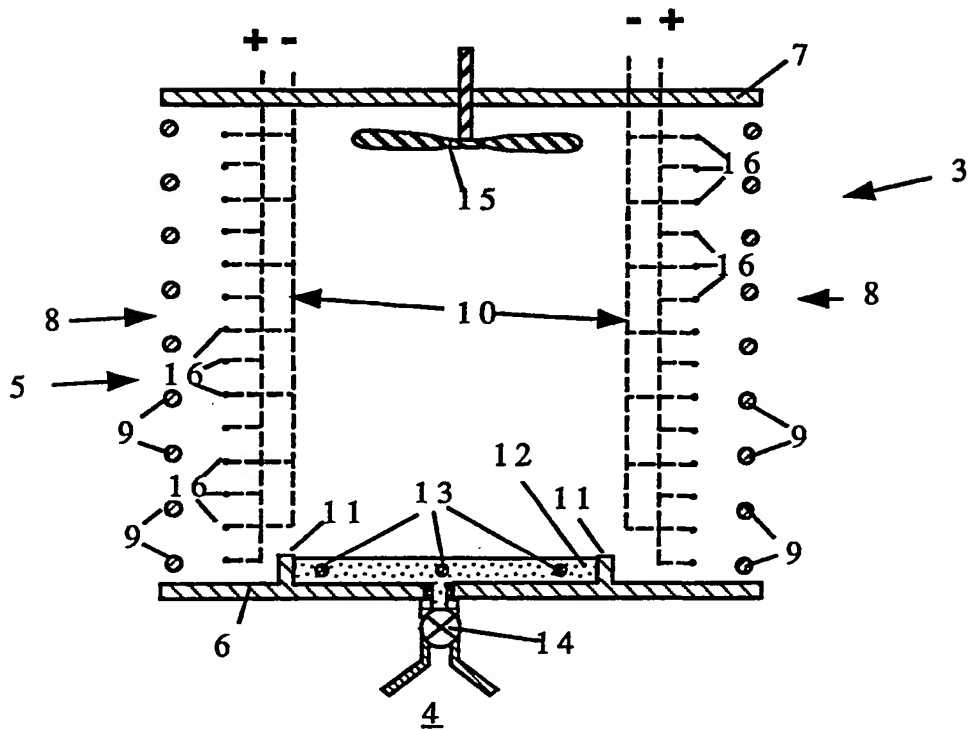
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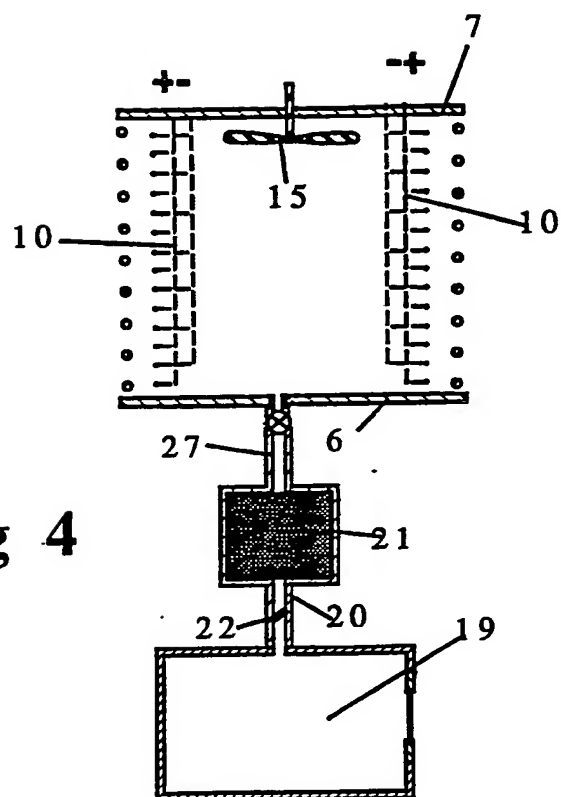
**Fig 1**



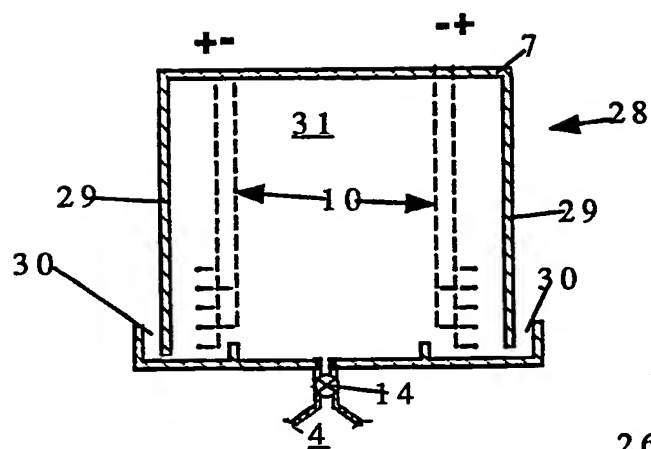
**Fig 3**



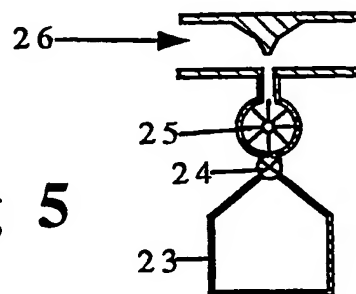
**Fig 2**



**Fig 4**



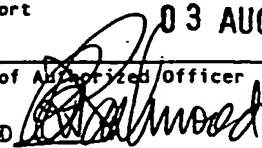
**Fig 6**



**Fig 5**

# INTERNATIONAL SEARCH REPORT

International Application No. PCT/AU 89/00271

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) 6		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl. <sup>4</sup> A01M 1/02		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched 7		
Classification System	Classification Symbols	
IPC	A01M 1/02, 1/04, 1/20, 1/22, 13/00	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 8		
AU : IPC as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 9		
Category*	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13
X	AU,A,74302/87 (SCHEIBYE) 19 November 1987 (19.11.87)	(1, 11, 14)
X	AU,A,55074/86 (ISTITUTO GUIDO DONEGANI S.p.A.) 2 October 1986 (02.10.86)	(1, 2, 11, 14)
X	AU,B,558987 (11355/83) (MCRAVER) 25 August 1983 (25.08.83)	(1-3, 11, 14)
X	AU,B,81284/82 (YOUNG) 26 May 1983 (26.05.83)	(1, 2, 11, 14)
X	AU,B,549360 (76509/81) (ALBANY INTERNATIONAL) 14 October 1982 (14.10.82)	(1, 2, 11, 14)
X	AU,B,531525 (54259/74) (PESTOLITE INC) 1 May 1980 (01.05.80)	(1, 10, 11, 14)
X	AU,B,530908 (51183/79) (CAMPBELL) 3 April 1980 (03.04.80)	(1, 10, 11, 14)
X	AU,B,514694 (27706/77) (AMCOR LTD) 15 February 1979 (15.02.79)	(1, 10, 11, 14)
X	AU,B,511536 (27203/77) (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ BV) 25 January 1979 (25.01.79)	(1, 2, 6, 11, 14)
X	AU,B,428979 (35227/71) (BUDSWORTH) 2 November 1972 (02.11.72)	(1, 2, 11, 14)
X	AU,B,106662 (5115/37) (HUDD ET AL) 2 March 1939 (02.03.39)	(1, 2, 10, 11, 14)
CONTINUED		
<p>* Special categories of cited documents: 10    "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance    "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"E" earlier document but published on or after the international filing date    "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means    "G" document member of the same patent family</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search 20 July 1989 (20.07.89)	Date of Mailing of this International Search Report 03 AUG 1989	
International Searching Authority Australian Patent Office	Signature of Authorized Officer BR DASHWOOD 	

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

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